

PATENT ABSTRACTS OF JAPAN

(11)Publication number : 10-132713

(43)Date of publication of application : 22.05.1998

(51)Int.Cl.

G01N 1/00

G01N 1/28

(21)Application number : 09-287419

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(22)Date of filing : 20.10.1997

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(30)Priority

Priority number : 96 19643320

Priority date : 21.10.1996

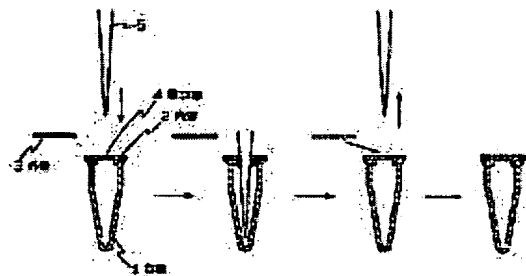
Priority country : DE

(54) CONTAMINATION-FREE OPERATION SYSTEM FOR THERMOCHEMICAL REACTION PROCESS

(57)Abstract:

PROBLEM TO BE SOLVED: To prevent leakage of fluid at the time of heating by employing a two element type enclosing system on a reaction container in which a first (inner) sealing element closes the container not hermetically but to prevent leakage of fluid and a second (outer) removable sealing element closes the container hermetically.

SOLUTION: A container 1 is enclosed using an inner cover 2 having a slit-like opening 4, for example. An outer cover 3 is separated from the inner cover when a pipet end 5 is inserted. After inserting a pipet unit, fluid can be sucked up or discharged. At that stage, the outer cover 3 is opened. When a pipet chip 5 is taken out, the container is enclosed by the outer sealing cover 3 and temperature processing can be carried out. The inner cover (sealing element 2) has a function for preventing unnecessary flow out of the fluid through the opening and made of an elastic sealing member. The outer cover (sealing element 3) sustains hermetic seal in the container when the inner cover fails or leakage takes place inadvertently.



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CLAIMS

[Claim(s)]

[Claim 1]A system characterized by comprising the following for heat treatment of a fluid.

One or two or more containers.

A lid of 1 for this container, or the fluid-tight nature of two or more insides.

1 or a lid of the two or more exteriors which can close said container airtightly.

[Claim 2]the inside of a container which can carry out a seal with a lid of internal fluid-tight nature, and an external airtight lid — or it being the method of transporting a fluid using a pipette device from a container, and, A method including a process of removing an external lid from said container and an internal lid if needed, a process of inserting a pipette device in a container through an internal lid, and a process of sucking up a fluid from a container to a pipette device, or distributing a fluid to a container from a pipette device.

[Claim 3]A method according to claim 2 of a pipette device being a pipette tip of a plastic, or containing a pipette tip of a plastic.

[Claim 4]liquid in which an internal lid was beforehand formed for said pipette device — a method according to claim 2 or 3 of having a dense penetration position.

[Claim 5]A method according to claim 2, 3, or 4 behind warmed before a fluid in a container is picked out from a container or is distributed in a container.

[Claim 6]in order that an external lid may maintain airtightness — warming — a method according to claim 5 pressed by said container during operation.

[Claim 7]A method according to claim 2 to which a pipette device is removed out of a container after a fluid transfer process is completed, and the seal of said container is airtightly carried out with an internal lid.

[Claim 8]A method according to claim 6 by which an external lid is warmed by lid heating machine style while a fluid is warmed.

[Claim 9]A system for heat treatment of a fluid which consists of the 1st closing element that can stop simultaneously a container and this container of a large number which are connected mutually and form a single unit, and the 2nd closing element that is physically [as this 1st closing element] disengageable, covers the 1st closing element concerned, and stops a container.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the performance method of the transfer process of taking a fluid in and out of the non-polluting formula operating system of a thermal reaction process, and a reaction vessel.

[0002]

[Description of the Prior Art] In the analyzing operation which impure-ization may generate, the method of this invention can be used by introduction and removal of an interfering substance. The molecule diagnostic analysis Oth especially accompanied by generation and amplification of a sample, for example, the European Patent, 201 When performing PCR given in the No. 184 Description, the reaction vessel of the problem of contamination to a direct vent type is required. However, when analyzing this kind automatically, a reaction vessel must be opened and closed repeatedly. The execution temperature of this process is 4-95 **, and serves as an element in which reservation of the sealing nature of a reaction vessel is much more serious.

[0003] relating to PCR especially about a reaction vessel with a sealing septum — the [International-Publication] — although explained by WO 95/No. 11083 Description, this is suitable only when removing the contents of a reaction vessel automatically, and it is not suitable for automatic introduction of the fluid to a reaction vessel. To put in a sample in a container, it is necessary to open a snap cap thoroughly manually. When adopting this container furthermore, a disposable pipette end must be used. This has the large power required when invading a septum, and is because such power cannot be provided at the general pipette end made from a plastic. a request — anti- — warming — a cap (cap counter-warming) can be used only under a fixed situation by the thermal instability which a septum has. Such influence is expressed in parallel. That is, it becomes easy to invade so that a septum is thin, but thermal instability nature becomes high.

[0004] the Europe public presentation patent Oth — 642 The system which has the same component and disadvantage on the No. 828 Descriptions is indicated.

[0005] the [International-Publication] — although the container for hemoglobin quantitation performed using potassium cyanide is written in WO 83/No. 01912 Description, the channel and the cap are attached to it so that the disassembled potassium cyanide may leak to the 1st stopper contained in this and it may not come out. This container does not fit the temperature treatment instead of a thing for temperature treatment.

[0006] the [International-Publication] — although the lid of the container is explained in WO 94/No. 05425 Description, the valve contained in this belongs to the type opened by making the fluid which pushes a cap top and exists in a cap flow out in a container.

[0007] Although the cap of the container for samples constituted by two elements is explained in the US,4,362,698,B Description, even if it closes these two elements, they cannot but become a pressure seal, and that function must be destroyed to separate a specimen container to elements.

[0008] The German public presentation patent 44th 12 Although a lid, a reaction vessel, and a lid manual operating device are consisted of by the No. 286 Description and the system which can perform said process automatically is explained in it, this system is disadvantageous at the point which needs an added component called a lid manual operating device. What is written in the German public presentation patent No. 29505707 Description with this point is the same. An opening mechanism operates it late.

[0009] In the lid device for reaction vessels written in the US,5,282,543,B Description, two or more lids are arranged as a single seal element in the unit. This equipment is unsuitable to the direct and automatic pipetting (pipetting) to a reaction vessel.

[0010] The purpose of this invention is to provide the system by which the fluid of an unsafe level does not begin to leak from a container even if it warms, since the fluid transfer which uses the general pipette end made from a plastic is possible, and the container is moreover sealed firmly.

[0011]

[Means for solving problem] The core of this invention is in 2 element-expression sealing system on the reaction vessel that a container is closed so that the 1st (inside) seal element may not leak not an airtight type but a fluid, and the removal-type 2nd (exterior) seal element closes a container at an airtight ceremony.

[0012]

[Mode for carrying out the invention] Hereafter, the system and method of this invention are explained, referring to an accompanying drawing.

[0013] The figure showing many processes of pipetting operation in which drawing 1 uses the element in connection with this invention, The figure showing the reaction vessel in which drawing 2 was provided with the seal element, the figure showing the reaction vessel with a seal element in the state where drawing 3 inserted the tip of the pipette, The figure showing arrangement of the heating block which drawing 4 equipped with the lid heating block, the figure in which drawing 5 shows the equipment for arrangement of many reaction vessels and a working seal element, The figure showing arrangement of the equipment which shows drawing 5 in the heating block provided with the lid counter heating block drawing 6, The figure in which drawing 7 shows the form of the opening of a seal element, the figure in which drawing 8 shows the example of connection of a seal element and a reaction vessel, The top view of the equipment with which drawing 9 contains 16 reaction vessels, the partial section side explanatory view of the equipment of drawing 9 connected by the transom of the product [drawing 10] made from a plastic, It is a side view of the manifold-type element of drawing 5 in which arrange drawing 11 in the top view of the manifold-type seal element for the equipment of drawing 9, drawing 12 has been arranged at the partial section side explanatory view of a manifold-type seal element, and drawing 13 has been arranged in automatic contrivance.

[0014] This invention relates to the equipment for dealing with the thermal reaction process of a fluid containing many containers, many 1st lid for each container, and one or more 2nd lids that can close many containers simultaneously. This invention relates to the transfer procedure for taking a fluid in and out of the container closed with the 1st and 2nd seal elements using a pipette device.

[0015] In this invention, the reaction vessel refers to the thing of the container 1 which can store a fluid in inside. Therefore, this container is in the possibility of closing, or the state where it was closed down. However, there are at least one or more openings which can be closed with the 1st lid and 2nd lid in a container. furthermore — a container — liquid — or it is not closed densely and airtightly, how which the opening which cannot be closed twists is good. Especially a container is heat resistance in respect of form, and it is preferred that it is inertness to the fluid which especially 110 ** stores. Substances suitable as a reaction vessel are heat good malleability plastics, such as polystyrene, polyethylene, and polypropylene. It is easy to fabricate such a substance using injection molding technique. Especially mold goods are designed as an object for throwing away. As construction material of a container, especially the polypropylene that is not transformed to 110 ** is suitable. Although the thing between 0.15 to 0.45 mm which has thin thickness is good if possible, if the wall of a reaction vessel is about 0.3 mm, it is still more preferred. It is better for form to be a cone type, and to be tapering off as it becomes a bottom. Although for 0.05 to 50 ml is preferred for capacity, it is still more suitable if it is 0.2 to 2 ml. The outside of a container is determined by the fact that it is usually inserted in a temperature unit, for example, a heating block, as good as possible and of being a design. For this reason, the thermal conductivity transmitted from culture units to the fluid of the inside of a container and an inside through a container wall improves. This kind of reaction vessel is commercially available.

[0016] It is also possible to connect many reaction vessels of each other. For example, the effective thing is proved, if it turns at 16 reaction vessels mutually and a bar thru/or the thing at which it turned and which was connected to two rows of each eight-piece sequence of every by the transom are used. As for a container, it is preferred to connect mutually by the method that it fits into heat cycler common as an object for execution of PCR, for example. In this way, the connected container can be processed one after another, for example in the minute titration plate system of 96-well. Hereafter, the expression "many containers" means 4-96 reaction vessels as a suitable thing, and means 8-16 reaction vessels as most suitable thing especially.

[0017] The inner cover (seal element 2) of this container has a function in which a fluid prevents leaking superfluously and coming out from the opening of a container. As for an inner cover, it is preferred that it is the sealant, for example, latex, or the product made of silicone rubber of elasticity. 20 to 100 Shore is preferred for it, and if the hardness of construction material is 30 to 60 Shore, it is more preferred. Here, as suitable construction material, elasticity is using especially Hellas tosyl LR 3003/40 which is 40 Shore (product of Germany made by BAKKA KEMI (Wacker Chemie)). As for the thickness of an inner cover, it is preferred that it is 0.1-20 mm and is especially 0.5-1.2 mm. This means that this thickness is based on the thinnest portion of the external parts. It means that thickness can be given to the end of a lid with the sealing ring 15 etc. since this increases the overall intensity of a lid, or so that a seal element can be inserted in a container opening. In order to make easy insertion of a pipette device, for example, the pipette end made from a plastic, the 2nd thin-walled part or opening 4 is arranged to an inner cover. This opening can be made into different geometrical form (refer to a-7d of drawing 7). This is for example, 1-15-mm length, or can be suitably made into the slit of 1-10-mm length. An opening can also be used as the cross-joint form or star shape with which the slit crossed. It is important for an opening that a fluid closes so that one drop may not leak, either. The slit of such 1st lid can be cut open or punched, for example with a knife etc. Depending on the case, it can also open into a forming cycle.

[0018]An inner cover is a lid of the type which can be individually arranged on each container (individual cap). However, depending on the number of reaction vessels, a manifold-type lid is also possible. Similarly the manifold-type lid 2 is suitably attached to a reaction vessel and/or a lid by the seal ring 15 of a lid by the adapter which invades into the opening of the container 1. As for an inner cover, if it can do by holding on a container and closing a container during procedure, not removing after that is preferred. An inner cover is a wrap thing about the whole opening, and further, a container rim can also be made into the thing of the type selectively inserted into a container, although it is better to be a wrap thing. As for an inner cover, it is preferred that is not airtight.

[0019]An outer cover (seal element 3) is for holding the hermetic seal in the container, even if on purpose or accidental leakage occurs in an inner cover. Therefore, this has always covered the opening in all the inner covers containing what formed like a slit at the time of manufacture, and the thing made by the tip of the pipette behind. Fundamentally, construction material will not be asked, if this outer cover is firmly pressed by the opening and/or inner cover of a container and it deals in it. Therefore, it is also possible to use a spring material which was described previously for an outer cover as a raw material for the 1st lid. In the case of an outer cover, since it is not necessary to suit manufacture or formation of an opening and and a pipette device does not invade, either, especially the upper part can be thickened. However, when warming a lid independently, thickness shall be 20 mm or less and 0.1–10 mm is especially preferred for it. Although it is for warming (warming) of a lid evaporating the water of condensation solidified to an inner cover, this function can also be included in an outer cover. However, warming of a lid can also be performed by the independent element. As for especially an outer cover, it is preferred that it is the layer which is on a heating nature element and is forced on a reaction vessel with the 1st lid by the whole and in which thin removal made from the quality of an elastic seal material is possible, for example, a mat. The outer cover shall close many 4–96 containers simultaneously, for example. If the number of containers is 8–16 pieces, it is more preferred. Especially one function in a suitable outer cover has it in an inner cover and a completely disengageable thing. An outer cover is removed when taking a fluid in and out of a container through an inner cover using a pipette. In this procedure, since an outer cover is removed from a container and an inner cover, when a pipette needle invades into the opening of an inner cover, it is not necessary to intrude an outer cover.

[0020]Especially fluid-tight nature in this invention means that a fluid does not begin to leak, unless additional power by a pressure resulting from warming is applied, or unless do not form an opening or it is expanded intentionally.

[0021]As for airtightness, a lid means 2.5 bars and that it can bear, without a pressure of 1.2 bars making a gas or a fluid leak from closed space, such as a container, suitably.

[0022]This invention relates to a method of taking in and out of a container which sealed a fluid with the 1st lid and 2nd lid further using a pipette device. This method includes a process of removing the face sealing element 3 from a container and the internal seal element 2, a process of inserting a pipette device in a container through the internal seal element 2, and a process of sucking up a fluid from a container to a pipette, or distributing a fluid to a container from a pipette device.

[0023]Transportable liquids are sample fluid or its derivation fluid for detecting existence of a fluid etc. which are derived from serum, a pia mater, plasma, and these which are ingredients, for example, a fluid which is the results of nucleic acid amplifying method, a fluid containing a reagent for performing detection of an ingredient of sample fluid, preparation, or amplification, etc.

[0024]A pipette device in this invention absorbs a fluid, and means apparatus or equipment which a measured part can arrange. In a **** portion of a pipette device, a fluid is attracted and emitted and this performs it. Fundamentally, these are possible also with reusable **** equipment like a metallic needle. However, especially the pipette tip 5 made from a plastic used only once as an object for fluid conveyance in this invention is preferred. Such a pipette tip made from a plastic is usually built with construction material which is not so tough to mechanical stress like polypropylene. The tip does not penetrate a standing lid carelessly rather than is so sharp. It is good to give slitting, such as slit shape, beforehand to an opening of an inner cover in this invention from such a Reason.

[0025]When inserting a pipette device in a container through an inner cover, it is desirable to carry out automatically for example, using commercial automatic-pipet equipment. However, a pipette device can also be fundamentally inserted manually using a hand pipette etc. In this operation, the opening in inner covers, such as a slit, is extended even to such an extent that a pipette device penetrates a lid and can invade in a container.

[0026]The further process in this invention is in any of the process of sucking up the fluid contained in a container to a pipette device, or the process of emitting the fluid contained in a pipette unit to a container. The work of adding a reagent, for example to sample fluid, and making a reaction cause in a container by such operation is attained. It is also possible to suck up and remove the specified quantity from processed sample fluid in a pipette device.

[0027]The system of this invention has a predominance, especially concerning the method supposing warming a

fluid within a container. warming — as for a container, in a process, it is desirable to seal with an inner cover and an outer cover, and to also keep some fluids or gases from leaking and coming out of a container as a matter of fact. In order to attain this, an outer cover is depressed by the fixed pressure according to the number of reaction vessels. Although this power is 10N from per [0.1N] reaction vessel, 1N to 5N is preferred for it. This pressure is good to generate by depressing a lid vertically with the electrode holder 12 like the metal plate which also includes a lid heating machine style, for example. It is desirable to make it move in this process at [an electrode holder is the most equal possible operation, and] right angles to the direction of a container cover. When using manifold-type equipment, all the containers shall be simultaneously closed under the same pressure conditions. In this case, the outer cover has prevented revealing gaseous fluid compositions, such as a steam and haze, to the environment besides a container against gas pressure. The method of amplifying nucleic acid like polymerase chain reaction (polymerase chain reaction) is included in the method of warming and cooling repeatedly the fluid contained in a container, for example. however, mere denaturation and a hybridization reaction — warming — a process may be included.

[0028]If the system of this invention is used, many suitable methods can be performed. In an initial stage, sample fluid is put into a container through an inner cover using a pipette. This container turns into a reaction vessel after that. A reagent required in order to generate a desired reaction may be added to sample fluid with a pipette, if it may put in first. The outer cover is opened between such pipetting processes. That is, the seal element 3 is removed. An outer cover is closed before heating and/or a cooling process start. an outer cover — warming — also after recovering until the gas pressure in a container is equivalent to outer atmospheric pressure when a process is completed and, it can remove again. the method same if required as the procedure mentioned above — a pipetting process and/or warming — a process is performed additionally. for example, warming — when removing a fluid from a container after a process, a pressure is equalized, an outer cover is opened, a pipette device is inserted through an inner cover, and the fluid of an initial complement is moved from a container to a pipette device. Subsequently, a pipette device is taken out through an inner cover and a fluid is further transported to a desired weighing cell for analysis processings or other reaction vessels etc.

[0029]The method of this invention has a process of addition of sealing a container again with an outer cover, after the fluid transportation process through an inner cover is completed. Therefore, it is possible to add a temperature treatment reaction and to perform it.

[0030]Drawing 1 shows the suitable fluid transfer method of this invention. The container 1 is sealed using the inner cover 2 which has the openings 4, such as slit shape. When inserting the pipette end 5, the outer cover 3 is separated from an inner cover. Sucking of a fluid or discharge is possible for after insertion of a pipette unit.

[0031]The outer cover is opened also in this stage. If a pipette tip is taken out, a container will be sealed with the face sealing element 3, and the execution of temperature treatment of it will be attained.

[0032]Drawing 2 is a reaction vessel usable at drawing 1, and the size shows that to which the actual twist was also expanded. In addition to the element indicated to drawing 1, the seal ring 15 which is a component of the inner cover 2 is also shown.

[0033]Drawing 3 is in the state which inserted the pipette tip 5 in the container 1 through the inner cover 2, and the size shows that to which the actual twist was also expanded. The lid 3 is removed.

[0034]In equipment on which the seal element (refer to drawing 4) 3 comes to function as a "mat" for many reaction vessels, the system of this invention is usable by connecting many reaction vessels 1 of each other. It can form as a unit which similarly connected separately the seal element 2 of each other which has an opening. The design in the minute titration plate style of 96-well is preferred.

[0035]As for the seal element 3, it is preferred to design as the lid heating block element 7 with easy exchange, as drawing 4 shows. For this reason, the electrode holder 8 for mats is equipped. The rotational center can fold up the heater element 7 which has a mat on the container 1 with the hinge shown by 9.

[0036]Drawing 5 shows the modification of the design. In this case, the hinge 11 and the frame 10 unite with the seal element 3, and the electrode holder 12 for reaction vessels is formed so that it can open, when performing the pipetting process shown in drawing 1.

[0037]Drawing 6 shows the design modification shown in drawing 5 in the heating block 6 and the lid heating block 7, and the rotational center 9.

[0038]Drawing 7 shows the geometric modification of the opening 4 in this invention for inserting a pipette tip. Drawing 7 a and 7b show slit and drawing 7 c and an opening with small 7 d.

[0039]The product made from silicone of a seal element is desirable, and the product made from polypropylene is preferred for a reaction vessel.

[0040]The lowness of the adhesion characteristic of such construction material is known well. Drawing 8 shows one possibility which forms the double width portion 14 which has the hole 13 corresponding to the rim ("ear") top of a reaction vessel, and fixes a silicone seal. It has sealed using the seal ring (15/graphic display of is not done) projected to the reaction vessel (refer to drawing 2).

[0041]Drawing 9 and drawing 10 show the reaction vessel for performing PCR. This example contains 16

containers and is connected to each sequence at a time by the bar thru/or transom in which this curved at eight rows [two]. This bar is built by form which does not change according to an elevated temperature. The reaction vessel has a double width portion (ear) (refer to 14 and drawing 8) for sticking with the seal element 2 (refer to drawing 11).

[0042]Drawing 11 shows the mat which is the seal element 2. The mat has the slit 4 in the position which belongs to each container. A seal element can be stuck on a container plate (above) by the hole 13.

[0043]Drawing 12 shows the section of the seal element 2. The seal ring 15 and the slit 4 (longitudinal direction figure) which were projected to the container are shown.

[0044]Drawing 13 shows the manifold-type equipment of drawing 5 in the state where the flap was raised. It is possible to stick one form, for example, a bar code, of identifying this equipment on a flap.

[0045]The advantageous point of this invention is one of the points which do not need special automatic modules at all, for example other than a usually available module like a pipette device. This means that this invention uses it directly as an object for molecule diagnostic measurement in automated analyzers, such as EREKUSHISU(Elecsys)1010 or a TEKAN (TECAN) pipette station. When using it as a seal for PCR cups, and a sample and an PCR mixture are moved with a pipette, all the reaction vessels are sealed. Therefore, haze is not attached. This is applied also to all of additional down stream processing. Since this invention does not need to open a lid, it simplifies a manual PCR pipette method substantially. This invention is effectively usable as a reaction vessel in the sample preparation methods. At a pipetting process, steel needles or a disposable pipette tip is used. A minute titration plate style is possible and manufacture by low cost is possible. Unlike the advanced technology, one is closed automatically [a lid] at least. Even if one of the notably advantageous points of this invention is after PCR, there is in the ability to pick out a fluid without contamination from a multiple-times container.

[0046]Next, this invention is explained in full detail according to the following embodiments.

[0047]Embodiment 1 this example explains the material for a system including drawing 6 and the element shown in 9, 10, 11, and 12.

[0048]In this example, polypropylene (Novolen1100 UCX which added 11NU10 by 3.5% of concentration) is used as a charge of reaction vessel material. An additive (the thing to 10% of concentration is usable) raises heat conduction, and a reaction mixture is early warmed much more within a heating block. If the especially thin wall (0.3 mm) and conical shape of a reaction vessel are possible, they have closed this.

[0049]The capacity of a reaction vessel is 0.25 ml.

[0050]The seal element 2 is BAKKA of Germany. It is desirable to comprise Elastosil LR 3003/40 made from KEMI (Wacker Chemie) (elastic 40 Shore (DIN53505), 1-mm-thick elastic silicone rubber).

[0051]In this embodiment, in order to promote extraction or discharge of a fluid by a pipette, a 4-mm slit is provided.

[0052]The seal element 3 is made from the identical material, and, similarly thickness is 1 mm.

[0053]Also to the sample preparation by embodiment 2 sample-preparation nucleic acid analysis, the reaction vessel and system of the same high capacity (for example, 1.5 ml) in connection with this invention are usable. experiment protocol by Bex Gillespie (D. Gillespie) A FOGERU stain (B. Vogelstein) and day (the National Academy of Sciences report.) According to the 76th volume, No. 2, and 615-619 pages, in order to separate nucleic acid from agarose gel in accordance with the method II, various temperature processes will be needed in 25 ** and 37 ** in February, 1979. The danger of contamination can be reduced if a protocol is automated using the system of this invention. an R boom (R. Boom) — other (the "clinical microbiology journal" March, 1990 item.) 495-503 pages and Py Em Liza Rudi (P. M.Lizardi) — other (the 98th volume of "analytical chemistry", 116-122 pages (1979)), although the comparative experiments about culture at 56 ** and 50 ** are explained, respectively, The danger of contamination can be reduced if the system of this invention performs this. A pipetting process is automatable by using x for exclusive use, y, and z automatic-pipet equipment (TECAN of a Canberra puckered company). A pipetting process can be performed without contamination, without adding any equipment, after removing the 2nd seal element 3 and placing a reaction vessel certainly on the work plane of a pipette device. Since all the containers are sealed with the seal element 2, the notably advantageous point of this invention is a point that haze does not enter at all in a reaction vessel.

[0054]

[Effect of the Invention]According to the system and method of this invention, since the fluid movement which uses the general pipette end made from a plastic is possible, and the container is moreover sealed firmly, even if it warms, the fluid of an unsafe level does not begin to leak from a container.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is a figure showing many stages of the pipetting operation which uses the element in connection with this invention.

[Drawing 2] It is a figure showing the reaction vessel provided with the seal element.

[Drawing 3] It is a figure showing the reaction vessel with a seal element in the state where the tip of the pipette was inserted.

[Drawing 4] It is a figure showing arrangement of the heating block provided with the lid heating block.

[Drawing 5] It is a figure showing the equipment for arrangement of many reaction vessels and a working seal element.

[Drawing 6] It is a figure showing arrangement of the equipment shown in drawing 5 in the heating block provided with the lid counter heating block.

[Drawing 7] It is a figure showing the form of the opening of a seal element.

[Drawing 8] It is a figure showing the example of connection of a seal element and a reaction vessel.

[Drawing 9] It is a top view of the equipment containing 16 reaction vessels.

[Drawing 10] It is a partial section side explanatory view of the equipment of drawing 9 connected by the transom made from a plastic.

[Drawing 11] It is a top view of the manifold-type seal element for the equipment of drawing 9.

[Drawing 12] It is a partial section side explanatory view of a manifold-type seal element.

[Drawing 13] It is a side view of the manifold-type element of drawing 5 arranged in automatic contrivance.

[Explanations of letters or numerals]

1 Container

2 Inner cover

3 Outer cover

4 Opening

7 Heater element

10 Frame

13 Hole

14 Double width portion

15 Seal ring

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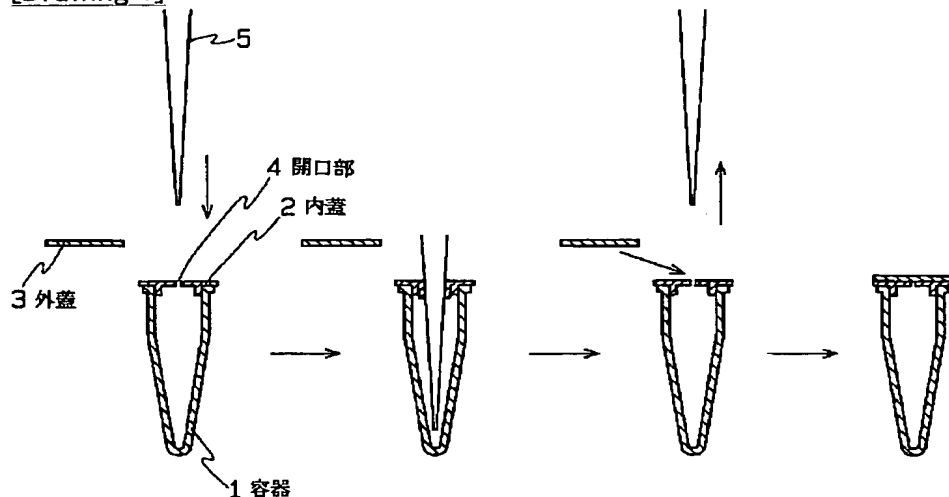
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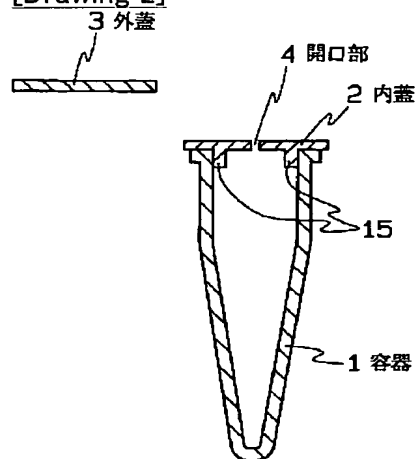
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DRAWINGS

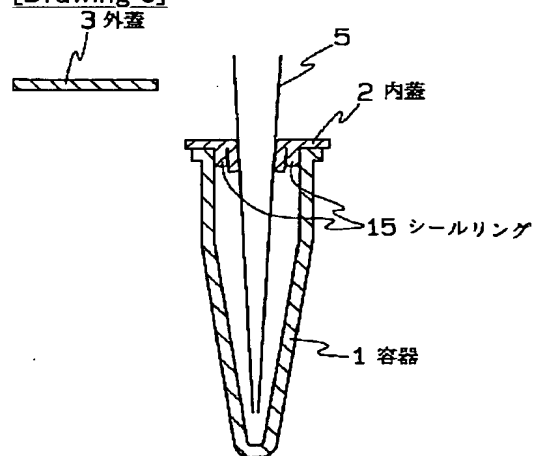
[Drawing 1]



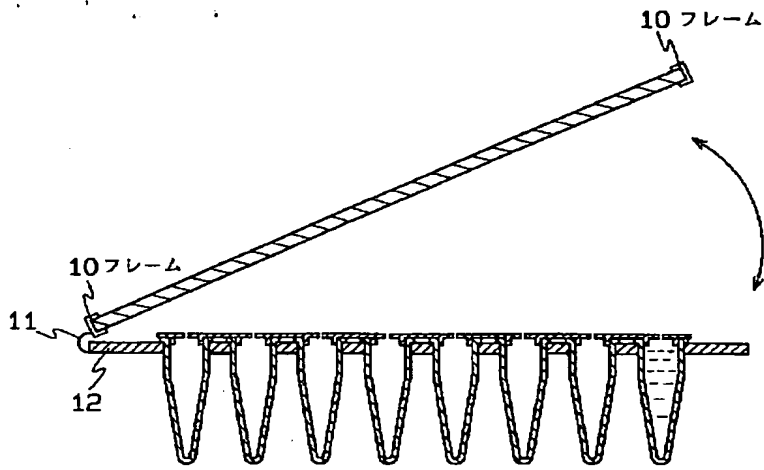
[Drawing 2]



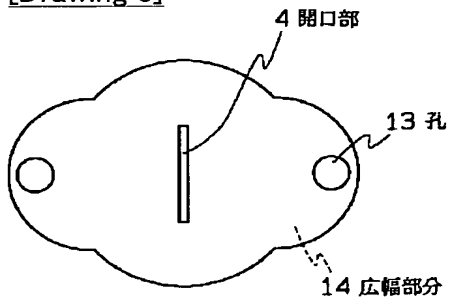
[Drawing 3]



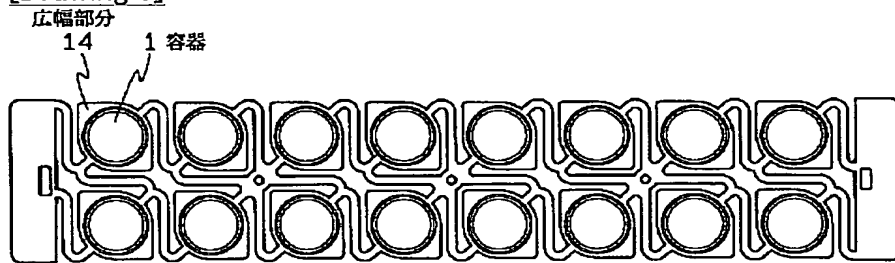
[Drawing 5]



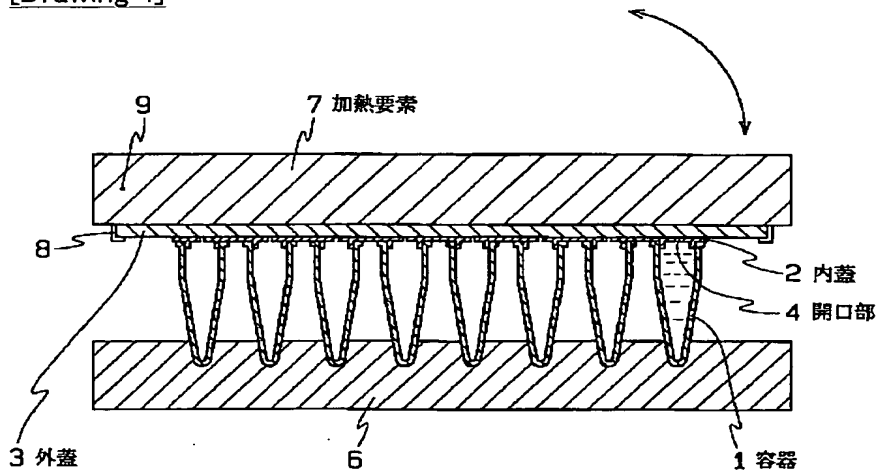
[Drawing 8]



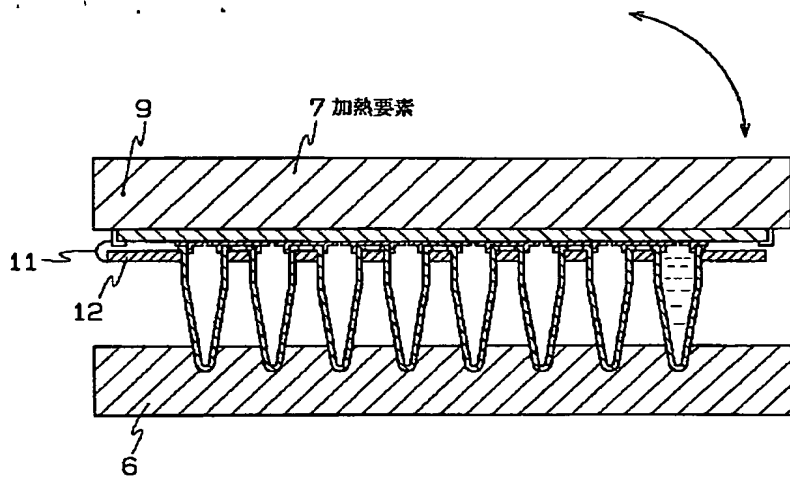
[Drawing 9]



[Drawing 4]



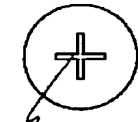
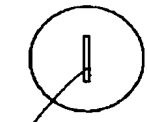
[Drawing 6]



[Drawing 7]

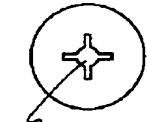
(a)

(b)



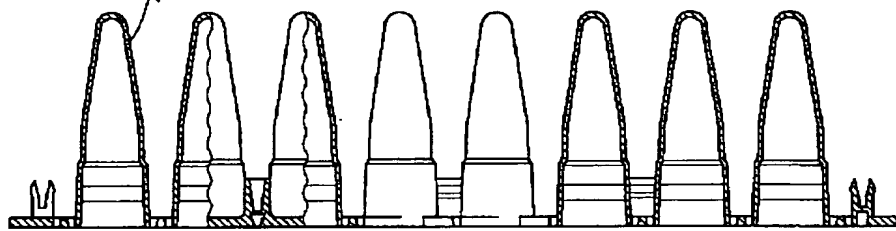
(c)

(d)



[Drawing 10]

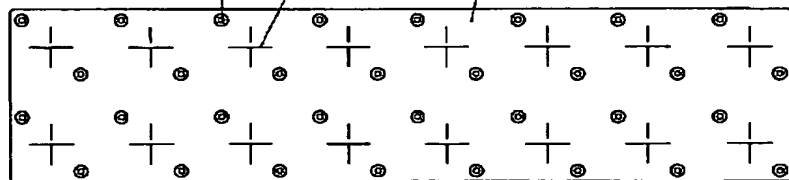
1 容器



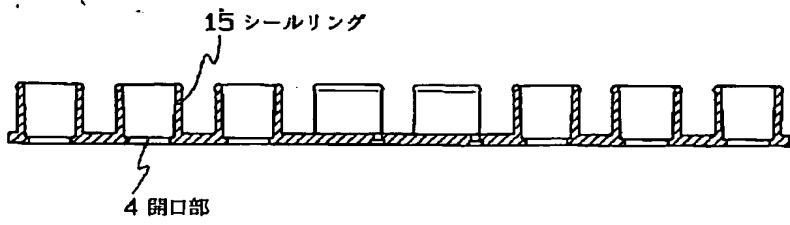
[Drawing 11]

13 孔 4 開口部

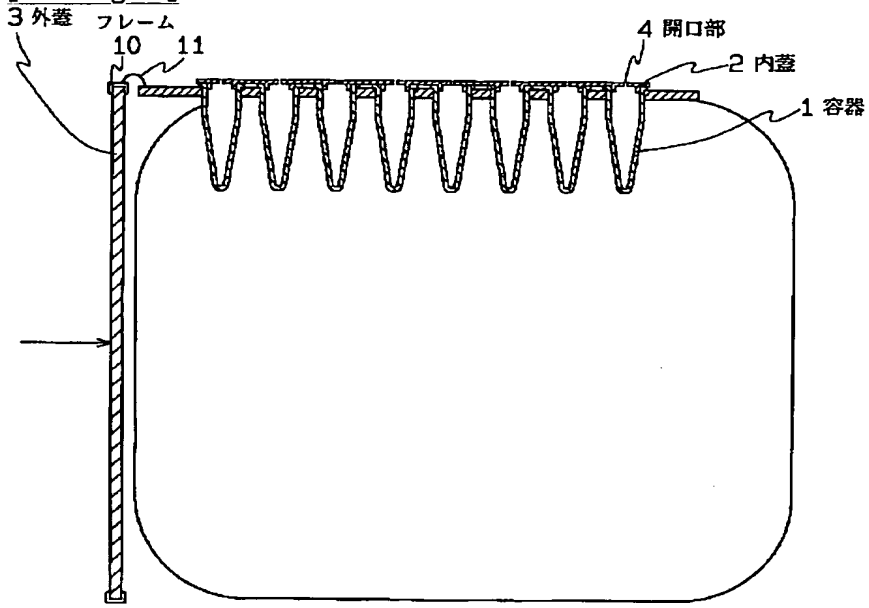
2 内蓋



[Drawing 12]



[Drawing 13]



[Translation done.]